

CLAIMS

- 1 1. A detachable counter assembly for a door system having a counterbalance  
2 system that includes a counter balance spring that is wound by a tool  
3 adapter to provide a selected tension for compensating for the weight of  
4 the door, the counter assembly comprising, a counter mechanism  
5 selectively rotatably affixed to the tool adapter, a sensor supported  
6 adjacent said counter mechanism and adapted to track rotation of said  
7 counter mechanism to generate tension information, and a display for said  
8 tension information associated with said counter mechanism.
- 1 2. The counter assembly of claim 1, wherein said display is coupled to said  
2 counter mechanism by wiring and provides a digital readout.
- 1 3. the counter assembly of claim 1, wherein said sensor engages said counter  
2 and displaces said counter mechanism a selected distance for each  
3 revolution of said counter mechanism.
- 1 4. The counter assembly of claim 1, further comprising a winding assembly  
2 releasably attached to the tool adapter at a first gear, wherein said first  
3 gear is selectively rotatably affixed to the tool adapter; a second gear  
4 engaging said first gear and adapted to rotate said first gear; a boss  
5 extending from said second gear, said boss having a tool receiving surface,  
6 wherein the counter assembly is supported on said winding assembly.
- 1 5. The counter assembly of claim 4, wherein said winding assembly includes  
2 a housing in which said first and second gears are rotatably mounted, said  
3 housing defining an axial opening for receipt of said tool adapter.  
4
- 5 6. A door system comprising, a door movably mounted on a track assembly,  
6 a counterbalance system connected to said door and having at least one

1        spring, a tool adapter proximate at least one end of said counterbalance  
2        system, a detachable winding assembly adapted to selectively engage and  
3        selectively rotate said tool adapter to adjust tensioning of said spring, and  
4        a locking assembly interacting with said counterbalance system to  
5        maintain a selected tensioning of said counterbalance system upon  
6        detaching said winding assembly from said tool adapter.

1    7.    A door system according to claim 6, further comprising a counter  
2        operatively interrelated with said winding mechanism to quantify and  
3        display tensioning of said counterbalance system.

1    8.    A door system according to claim 6, wherein said locking mechanism is a  
2        pawl and ratchet.

1    9.    A door assembly according to claim 6, wherein said winding assembly  
2        includes a housing, a first gear rotatably mounted within said housing  
3        having a first axis of rotation positionable coaxial with said tool adapter,  
4        said first gear defining a receiver adapted to rotatably fix said first gear to  
5        said tool adapter, a second gear operatively interconnected with said first  
6        gear to cause rotation thereof, said second gear being rotatably mounted  
7        in said housing with a second axis of rotation substantially perpendicular  
8        to said first axis of rotation, a boss adapted to receive a driver extending  
9        outwardly from said second gear.

1    10.   A door assembly according to claim 9, further comprising a counter  
2        assembly having a fixed gear attached to an outer surface of said housing  
3        around an opening, a counter cam rotatably coupled to said first gear, and  
4        a rotating gear rotatably mounted on said housing and operatively  
5        interrelated with said fixed gear, wherein said counter cam has an

6 eccentric profile and engages said rotating gear to rotate said rotating gear  
7 a selected circumferential distance for each revolution of said counter cam.

1 11. The door assembly of claim 10, wherein said circumferential distance is  
2 equal to about one revolution and one tooth on said fixed gear.

1 12. The door assembly of claim 11, wherein said rotating gear is formed on an  
2 interior surface of said counter, and a scale is attached to an exterior  
3 surface of said counter, wherein said scale is adapted to indicate  
4 revolutions of movement of said counter relative to said fixed gear.

1 13. The door assembly of claim 12, wherein said scale includes a label having  
2 indicia thereon.

1 14. The door assembly of claim 10, wherein said first gear defines a socket  
2 coaxial with said receiver, said socket adapted to rotatably fix said  
3 counter cam to said first gear, wherein said socket has a reduced radial  
4 dimension relative to said receiver defining an annular shoulder  
5 engageable with said tool adapter to prevent over-insertion thereof.

1 15. A detachable tensioning tool in combination with a door system  
2 comprising, a door movably mounted on a track assembly, a  
3 counterbalance system connected to said door, first and second tool  
4 adapters at each end of said counterbalance system connected to first and  
5 second springs, a winding assembly including a housing and adapted to  
6 selectively engage and selectively rotate either of said first and second tool  
7 adapters, and stop surfaces on said housing preventing rotation of said  
8 housing during tensioning of said counterbalance system.

- 1 16. A detachable tensioning tool according to claim 15, further comprising  
2 brackets mounting said counterbalance system and attached to fixed angle  
3 irons.
- 1 17. A detachable tensioning tool according to claim 16, wherein said stop  
2 surfaces engage said angle irons.
- 1 18. A detachable tensioning tool according to claim 16, wherein said stop  
2 surfaces include a first stop surface and a second stop surface, said first  
3 stop surface engaging one of said angle irons when said winding assembly  
4 engages one of said first and second tool adapters and said second stop  
5 surface engaging a second of said angle irons when said winding assembly  
6 engages the other of said first and second tool adapters.
- 1 19. A detachable tensioning tool according to claim 14, wherein said winding  
2 assembly includes a gear having oppositely projecting driver engaging  
3 bosses, one of said driver engaging bosses engageable when said winding  
4 assembly is in engagement with said first tool adapter and a second of said  
5 driver engaging bosses engageable when said winding assembly is in  
6 engagement with said second tool adapter.
- 1 20. A detachable tensioning tool according to claim 15, wherein said winding  
2 assembly includes a driver engaging boss extending outwardly from said  
3 housing along an axis, and wherein at least one of said stop surfaces is  
4 adapted to position said housing such that said axis of said driver engaging  
5 boss extends rearwardly and downwardly.
- 1 21. A detachable tensioning tool according to claim 19, wherein at least one  
2 of said stop surfaces slopes downwardly and inwardly relative to said drive  
3 engaging boss.

- 1 22. A detachable tensioning tool according to claim 14, wherein said  
2 counterbalance system has a locking mechanism for maintaining a selected  
3 tension in said counterbalance system.
- 1 23. A detachable tensioning tool according to claim 14 further comprising,  
2 a counter associated with said winding mechanism to quantify and display  
3 tensioning of said counterbalance system.
- 1 24. A detachable tensioning tool according to claim 23, wherein said counter  
2 has different indicia for either of said door and said counterbalance system  
3 having different characteristics.
- 1 25. A detachable tensioning tool for use with a door system having a door  
2 frame enclosing a door opening, a door movably mounted on a track  
3 assembly attached to the door frame, a counterbalance system supported  
4 on brackets attached to the door frame and at least one tool adapter at an  
5 end of the counterbalance system, the tensioning tool comprising, a  
6 winding assembly including a housing and adapted to selectively engage  
7 and selectively rotate the tool adapter and at least one stop on said  
8 housing adapted to operate independent of the brackets to prevent  
9 rotation of said housing during tensioning of the counterbalance system.
- 1 26. A detachable tensioning tool according to claim 25, wherein said stop  
2 engages the door frame to prevent rotation of said housing during  
3 tensioning of the counterbalance system.